

Auroral Chorus II: The Music of the Magnetosphere
Naturally-occurring VLF Radio Phenomena Recordings
by Stephen P. McGreevy

First heard on long telephone wires in the 1880's, these mysterious radio signals of Earth were the first radio signals people ever heard. You will be astounded by their variety and beauty!

June 1996 Solar-Minimum VLF Expedition to Alberta, Tracks 1 - 5

The following five tracks were the wonderful results of a road-trip recording expedition to Alberta and the Northwest Territories in late May and early June of 1996 during the lowest portion of the solar cycle when sunspots are at their minimum. This was to be one of two long trips embarked upon that year to fully examine and capture recordings of natural VLF phenomena while the sun was at its quietest. Also, I'd never before captured such gorgeous recordings.



Northbound on Alberta Highway 39 south of Viking, Alberta, 31 May 1996. Huge cumulonimbus clouds were building up each day across the province sparking big lightning storms and associated natural VLF radio phenomena.



Northern Alberta boreal-forest road leading westward from Dixonville into the Whitemud River area and the location I would be for 2 days (02 to 04 June 1996).



Three-meter (10 ft.) tall copper-pipe vertical antenna used to record tracks 1 to 5

- 1) Beautiful sounding wavering tones and risers mimicking whale song and tropical birds. I consider this one of my finest recordings ever made of this truly gorgeous mixture of VLF phenomena. This track was recorded 02 June 1996, in the Whitemud River area, northwestern Alberta, at 4:15 a.m. MDT (1015 UT). Duration 11:12



These were the thunder/lightning storms causing such strong lightning static as well as the launching the fabulous nose whistlers recorded on 02 June 1996 (Tracks 2 to 5)

- 2) Nose whistlers mixed in with slowly rising and falling emissions occurring in a “ping-pong” fashion, taped almost 4 hours after track 1 above (spectrograms of them look like an image of a person’s nose). Recorded on 02 June 1996 at 8:00 a.m. MDT (1400 UT): Duration 5:49
 - 3, 4, and 5) Nose-whistlers launched from lightning storms moving into the area -- lightning static is most strongest in track 5 when lightning was within 10 miles of my monitoring and recording location. These three tracks were recorded on 02 June 1996 between about 11:45 and 13:00 Mountain time (1745 - 1900 UT) Track Durations: Track 3 is 1:30, Track 4 is brief, only 20 seconds, Track 5 is 4:02.
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Four Tracks of recordings made during my Summer '96 Solar-Minimum VLF Expedition to Manitoba, Canada (Grass River Provincial Park), 22 Aug. to 05 Sept. 1996, Tracks 6 - 9

These two weeks right in the auroral-zone were awesome! When I arrived on 22 August 1996 to this central Manitoba location deep within the Canadian boreal forest, there was a moderate magnetic-storm in progress and the auroral Borealis (Northern Lights) appeared over the entire sky the first and second nights of my stay. Despite declining magnetic disturbances until the 29th of August and a waxing moon - soon to be full on the night of the 28th, the auroral never failed to dazzle me with hours of truly beautiful sights in the nighttime skies, sometimes just a faint arch to the north but often breaking out into lovely forms: swirls, pillars, and curtain. A memorable two weeks! late August has about 5 to 6 hours of total darkness at latitude 54 north in Manitoba, and the aurora is plainly visible each night!



Full-moonrise - Grass River Prov. Park, Manitoba - Aug. 29th, 1996



*Sunset - Grass River Prov. Park, Manitoba - Aug. 29th, 1996 -
good view of WR-4b VLF antenna, a 3-meter vertical whip*

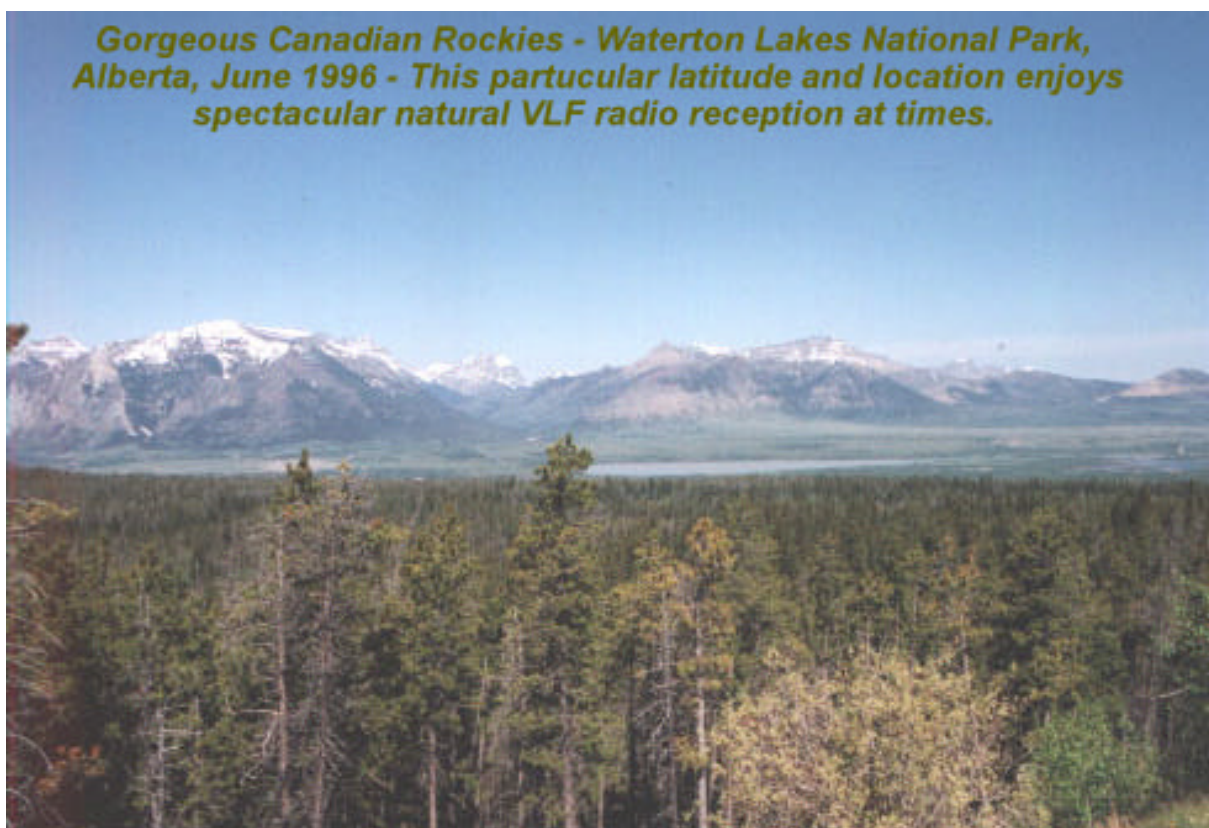


Mosaic of aurora photos taken August 23-29, 1996
from Grass River Prov Park, Manitoba - McGreevy

Above: color and B&W image mosaic of several auroral forms photographed in Manitoba's Grass River Provincial Park between 23 to 29th August 1996.

- 6) A mixture of generally low and medium-pitched Chorus of moderate intensity. Interesting sounding bursts of low squawks and then higher pitched chirps in response. Recorded 28 August 1996 at 8:50 a.m. Central Daylight Time (1350 UT). Duration 3:00
- 7) Low-pitched Hiss of quite loud intensity (sounding like a jet plane in flight) along with a couple of weak fast pure-tone whistlers toward the beginning of this track. There are also numerous risers (the opposite of whistlers). Recorded 24 August 1996 at 11:00 a.m. CDT (1600 UT) Duration 1:10

Stereo Recording VLF Expedition to Waterton Peace Park, southern Alberta Canada, 20 June 1998, Tracks 10 - 18



Three night's stay in Waterton Park resulted in the wonderful stereo recordings in the next 8 tracks. These are natural VLF radio phenomena recorded in stereo using two large wire loops oriented cross-azimuth. These loop antennae, both about 400 feet of wire wound and bound together into a 6-turn configuration, where hung in a couple of Aspen trees in triangular form. In Tracks 10 and 11, the RIGHT-channel loop was oriented to be most sensitive to VLF signals coming along the magnetic longitude (also has some powerline hum) and the LEFT channel loop oriented to null signals coming from the magnetic longitude (i.e. oriented 90 degrees in azimuth away from the left channel loop along an east/west orientation).

In Tracks 13 through 18, the opposite is true - the LEFT channel loop is most sensitive to the north/south magnetic longitude direction

It was also during this stay that I met Barrette Golding, a freelance-radio show producer whom joined me from Montana to record material for several radio shows he would later produce, including the Canadian Broadcasting Commission and also National Public Radio. My father was thrilled at being able to witness Barrette with his recording equipment and to enjoy a few nights of camping in the Alberta wilderness.

These are the first known stereo natural VLF radio recordings publicly released on CD in 1999. Portions of these recordings were aired on Barrette Golding's radio shows he produced for National Public Radio in the U.S. and also the Canadian Broadcasting Corporation.



Belly River campground, June 9, 1996. This location on the right (campsite #22) was also the exact place I recorded the June 1998 Stereo recordings on Tracks 11 to 18. The grogeous Rocky Mountains in Montana loom in the background.

- 10) This track is of very strong Dawn Chorus of moderate density. The chorus in the left channel is lower pitched than the right channel - directionality of chorus is quite noticeable in this track. Recorded 20 June 1998 at 8 a.m. MDT (1400 UT). Duration: 1:22
- 11) STEREO: This brief segment was the first stereo natural VLF radio recording of whistlers I put on the Internet in early 1999. It is of beautiful near-pure-tone whistlers streaming down at a high rate, recorded 19 June 1998 at about 8:00 p.m. MDT (20 June 98 - 0010 UT) Duration 0:34
- 12 and 13) STEREO: These two brief tracks are more stereo whistler recordings I had placed on the Internet - essentially the same activity as the track above. Track 12 duration is 0:19 and track 13 is 0:38

- 14) STEREO: A long, recording of whistlers taped around 7:45 p.m. 0145 UT. The variety of whistlers make for a fascinating recording! In this long track, the LEFT channel (with more powerline hum) is the loop antenna facing north/south, as described earlier. Duration 4:33
- 15) STEREO: Made using the identical receiver settings and loop connections as Track 14, this , long, lovely stereo recording of chorus was made about 13 hours later than Track 14's recording, at about 8:15 a.m. MDT (1415 UT), 20 June 1998. There is noticeable directional effects in the chorus elements, and at 2 minutes 55 seconds into this track, there is a lightning static burst generating a diffuse, hissy whistler 3 seconds later, most noticeable in the right channel. Duration: 5:03
- 16) STEREO: The chorus is much more dense in this track than the previous track (15). Recorded a bit later on in the morning, at about 9 a.m. MDT (1500 UT) 20 June 1998. Duration 2:33
- 17) STEREO: The chorus is past peak density and beginning to wane in density, but is quite loud anyway, and the individual components are more readily audible. Recorded about 9:30 a.m. MDT (1530 UT). Duration: 2:57
- 18) STEREO: This track contains two segments, both segments were taped during the waning phase of that morning's chorus event. Recorded 20 June 1998, approx. 9:00 a.m. to 9:15 a.m. MDT (1600 - 1615 UT). Duration: 2:43
- 19) Low-Pitched chorus recorded in the daytime - at around 6 p.m. MDT 04 June 1996 (0000 UT) on a hand-held WR-3E receiver, right above Alexandria Falls/Hay River, NWT. This is an extra track not appearing on the standard CD-audio release of "Auroral Chorus II."

**Produced and mastered from original analogue tapes by Stephen P. McGreevy, Stereo Natural VLF
Radio Phenomena Recordist, Autumn 1999**

These recordings have not been altered in any way, whatsoever.

Converted to MP3 format by Stephen P. McGreevy, August 2003

S. P. McGreevy Productions, P.O. Box 928, Lone Pine, CA 93530, USA

www.auroralchorus.com

www.spaceweathersounds.com

